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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,276	01/14/2002	Goro Nakatani	040894-5755	4701
9629	7590	10/24/2003	EXAMINER	
MORGAN LEWIS & BOCKIUS LLP 1111 PENNSYLVANIA AVENUE NW WASHINGTON, DC 20004			IM, JUNGHWA M	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 10/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/043,276

Applicant(s)

NAKATANI ET AL.

Examiner

Junghwa M. Im

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 8-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 8-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>10</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-4 and 8-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites that a silicon nitride film formed so as to cover a whole surface of the inter layer dielectric. However, Figure 1 of the Application shows that only the top surface of the inter layer dielectric layer is covered by the silicon nitride while the sides of the inter layer dielectric layer covered with the barrier layer.

Claim 8 recites "...a silicon nitride film covering an entire surface of the inter layer dielectric layer around the contact hole..." However, Figure 1 of the Application shows that the barrier layer covers the entire surface around the contacting hole of the inter layer dielectric layer not the silicon nitride film.

Claims 2-4 and 9-13 are dependent on the rejected base claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4 and 8-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US 6410414) in view of Toyosawa et al. (US 6441467), hereafter Toyosawa.

Regarding claim 1, insofar as understood, Fig. 6 of Lee shows semiconductor device comprising:

a first interconnect layer (102) arranged above a substrate (100) on which a functional semiconductor region is formed (col. 3, lines 7-10), an inter layer dielectric (104) covering a surface of the interconnect layer, and a silicon nitride film (106; col. 3, line 28) formed over a top surface of said interlayer dielectric, a metal interconnect layer (110) covering over said silicon nitride film and a planarized dielectric (116) formed on the metal interconnect layer.

Lee shows substantially the entire claimed structure except the uppermost metal layer made of gold. Fig. 1 of Toyosawa shows a gold uppermost metal layer (col. 3, line 53) formed on the aluminum interconnection layer. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Toyosawa to the top metal layer of Lee since a uppermost layer made of gold increases the conductivity and mechanical strength of the interconnection layer.

Regarding claim 2, Fig. 6 of Lee shows a planarized top dielectric (116) is consisted of polyimide (col. 5, lines 47-52).

Regarding claim 3, Toyosawa discloses the silicon nitride film is formed by plasma CVD method (col. 9, lines 55-58).

In addition, "high-density plasma CVD" is a process designation, and would thus not carry patentable weight in this claim drawn to a product. See *In re Thorp*, 227 USPQ 964 (Fed. Cir. 1985).

Regarding claim 4, Fig. 6 of Lee shows a part of the polyimide layer is removed, forming a bond pad region (118) for bond wire connection through solder ball (114).

Regarding claim 8, insofar as understood, Fig. 6 of Lee shows a semiconductor device comprising:

a first interconnect layer (102) covering a first portion of a surface of a functional semiconductor region (col. 3, lines 7-10); an inter layer dielectric (104) covering a second portion of the surface of the functional semiconductor region and a portion of a surface of said first interconnect layer, thereby forming a contacting hole on the surface of the first interconnect layer; a silicon nitride film (106) covering a top surface of said inter layer dielectric around the contacting hole on the surface of the first interconnect layer; forming a metal interconnect region (110); and a planarized dielectric (116) covering the metal interconnect layer and the silicon nitride surface around the metal interconnect region.

Lee fails to show a barrier layer formed around the contact hole for the gold metal layer. Fig. 1 of Toyosawa shows a barrier metal layer (16; col.7, lines 48-51) formed around the contact hole for the gold metal layer (17).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Toyosawa to the device of Lee in order to have a barrier metal layer around the contact hole since the barrier layer provides a better adhesion of the metal layer to the dielectric layer which aspect is well known in the art. And It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Toyosawa to the top metal layer of Lee since a uppermost layer made of gold increases the conductivity and mechanical strength of the interconnection layer.

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Regarding claim 9, Toyosawa disclose that the barrier layer consists of titanium (col. 7, lines 48-50).

Regarding claims 10 and 11, Lee discloses the first interconnect layer consists of aluminum (col. 3, line15).

Regarding claim 12, Lee discloses the inter layer dielectric consists of USG film (silicon oxide; col.3, lines 28-29).

Regarding claim 13, Fig. 1 of Toyosawa shows the functional semiconductor region further comprises a polysilicon gate (3) isolated from the first interconnect layer by a second dielectric layer (10), wherein the first interconnect layer is connected to the polysilicon gate through a contacting area disposed within the second dielectric layer.

Response to Arguments

Applicant's arguments with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (703) 305-3998. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

jmi
October 15, 2003



EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800